Sorghum Molecular Genetics

TIGR Plant Genome Annotation Workshop
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Sorghum Agronomy

- Sorghum is the fifth most important cereal.
- Originated in sub-saharan Africa.
- Sorghum is maize’s drought tolerant cousin.
- Maize and sorghum diverged ~12 Myr ago.
- Sorghum has 10 chromosome pairs (740 Mb).
- Maize has 10 chromosome pairs (2500 Mb).
- Human food stuff in Africa and Asia.
- Animal feed in the United States.
- Grain used feedstock for ethanol production.
Sorghum Genetic Maps

- Many genetic maps.
- Crosses are easily made.
- High degree of molecular genetic diversity.
- Genetic markers are abundant.
- RFLPs, AFLPs, SSRs.
- Common grass markers.
Sorghum Physical Maps

- Several BAC libraries.
- Several labs develop genetic markers in conjunction with placing markers on BACs.
- Physical and genetic map linkages.
- Strong cytogenetic mapping efforts.
EST Resources

- ESTs from nine tissue libraries.
- 203,000 EST sequences.
- Rice - 1,178,000
- Maize - 1,014,000
Sequencing Efforts

- Shotgun sequencing of methyl-filtrated DNA, 300Mb, 96% genes partially sequenced.
- Shotgun sequencing of high-Cot DNA by JGI.
- Rice genome was sequenced using the BAC by BAC approach and full genome shotgun sequencing.
- Maize genome has been analyzed by sequencing methyl-filtrated DNA and will be sequenced using high-Cot DNA.
- Sorghum genome sequence is incomplete and must be interpreted in the context of a fully sequenced genome.
Sorghum Sequence in Context of the Rice Genome
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Transformation/Gene Disruption

- Agrobacterium-mediate gene transformation
- Projectile bombardment.
- Transformation of cell cultures requires screening and regeneration.
- Characterized Transposon System (RescueMu, Ac/Ds)
- Vidus Induced Gene Silencing
- None of this is possible in sorghum.
- Transient transformation is the norm.
Characteristics of the Ideal Plant for Molecular Genetics

- Large amount of characterized genetic diversity.
- Large community of molecular genetic researchers.
- Easily transformable or some method for disrupting expression.
- Pre-sequenced genome.
Requirements for Molecular Genetic Research in Non-Ideal Species

- Genetically diverse germplasm.
- Ability to generate segregating population.
- Cooperative research community
- Funding agency interest.